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(54) **Portable power generating device**

(57) A portable power generating device incorporating or associated with an electrical load, e.g. a torch, comprises mechanical drive such as an external pivoted lever 5, operable by the user, which imparts motion to the rotor, secured to shaft 16, via a gear train driving the rotor and a flywheel 17. The motion of the flywheel is transmitted to a gear driving the rotor, by another gear which rotates faster than the gear driving the rotor. A lamp may be separate or separable from the torch body housing of the generator. The lever may be foot operated. The generator may heat a wire for ignition applications. Gear parameters are specified.

Fig.1

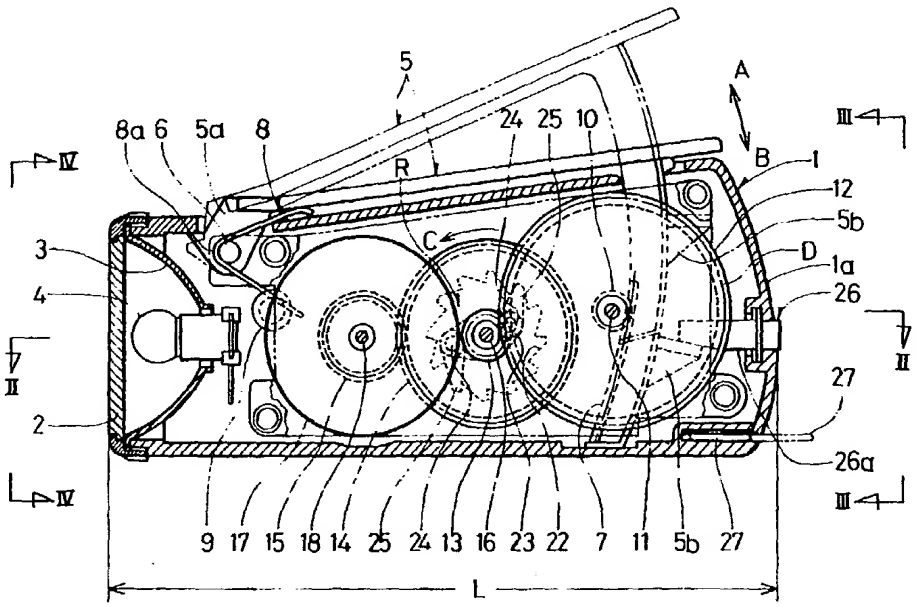

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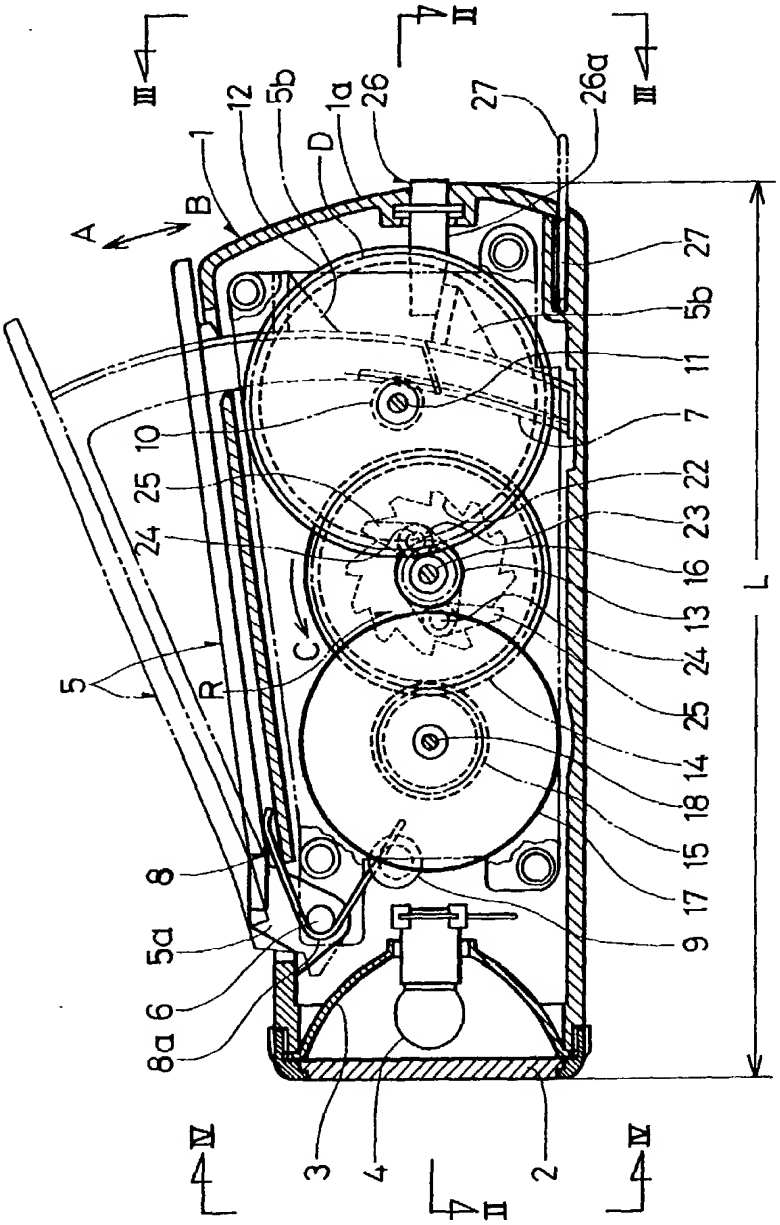
Fig.1


III
II
III
12
5b
1a
26
27
26a
1
D
B
A
27
5b
11
7
22
23
16
13
24
25
14
18
15
17
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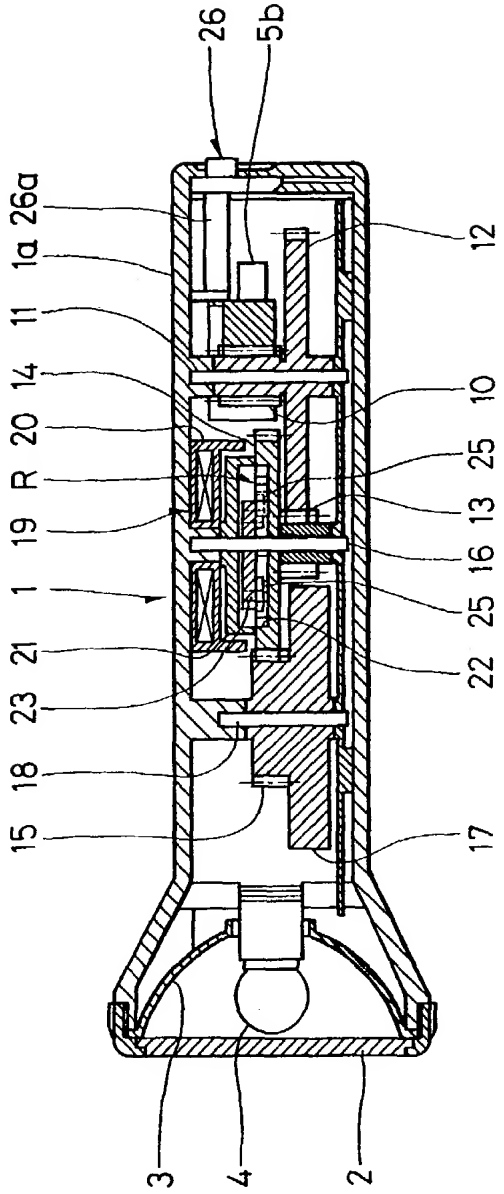


Fig. 2

Fig. 3

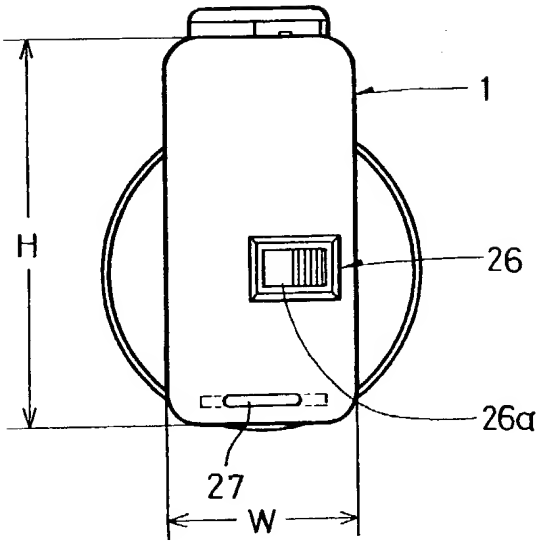
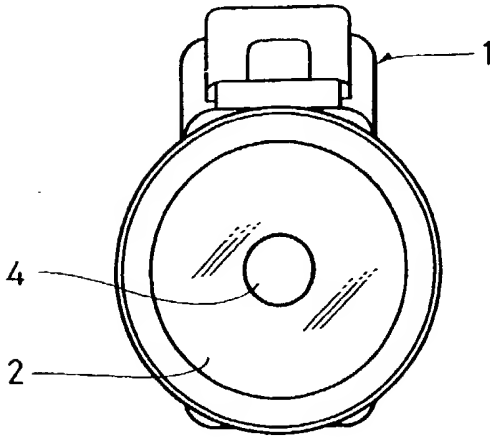


Fig. 4



SPECIFICATION

A portable power generating device

The invention relates to a portable power generating device, and more particularly to such a device in which a mechanical drive operated by the user, imparts motion to the rotor of an electrical power generator. In known devices motion is normally transmitted to the rotor via a gear train driven by a manually operated lever, and a ratchet mechanism.

Various portable electric torches have been developed which, to save the battery incorporate a power generator which can be driven at a sufficiently high speed, to effectively light the electric bulb, but require rapid successive movements of the manually operated lever to maintain the effective power level. In fact, these electric torches maintain satisfactory light if the manual lever is operated at short (about 1 second) intervals, but the light fails immediately after the user of the electric torch ceases to operate the lever. It is therefore impossible for the user to maintain a satisfactory light for an extended period, since the user tires quickly.

With the aim of mitigating the defects and disadvantages of known devices we propose incorporating a flywheel in the transmission mechanism of a power generating device.

According to this invention a portable power generating device of the kind in which a mechanical drive operated by the user imparts motion to the rotor of an electrical power generator, wherein motion is transmitted to the rotor by a mechanism comprising a gear train driving the rotor and a flywheel, the motion of the flywheel being transmitted to a gear driving the rotor, by another gear which rotates faster than the gear driving the rotor.

Other features of the invention are set forth in the appendent claims.

By virtue of the present invention the power generator is driven at a high speed with a considerable torque and an extended period for each stroke operation of the manually operated lever. Thus the device is less tiring to use than conventional devices.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings:

Figure 1 is a cross-sectional side elevation of a torch incorporating a p wer generating device according to this inv ntion;

Figure 2 is a cross-sectional plan view of the torch taken on II–II in Fig. 1;

Figure 3 is a rear elevation of the torch taken on III–III in Fig. 1; and

Figure 4 is a front levation of the torch taken on IV–IV in Fig. 1.

Figs. 1 to 4 show a portabl el ctric torch 1 with an longate housing 1a which is approximat ly 142 mm long, 59.5 mm high and 30 mm wide as shown by L, H and W respectively in Figs. 1 and 3. As generally known, a lens 2, a parabolic plate 3 and an electric lamp 4 are arranged in the forward end part of the housing 1a. A manually operable lever 5 has a base 5a pivoted on a transverse pin 6 secured to the housing 1a. The lever 5 has a sector rack 7 mounted thereon remote from the base 5a and extending downwardly into the housing 1a. A torsion spring 8 with a centre 8a embracing the transverse pin 6 presses, at one end, against another transverse pin 9 secured to the housing 1a and at the other end against the underside of the lever 5, so that the manually operated lever 5 is baised upwardly toward an extended position thereof and is movable up and down as indicated by arrows A and B, in opposition to the spring 8.

A pinion 10 rotatably mounted on a transverse shaft 11 secured to the housing 1a engages the sector rack 7 and is integral with or fixed to a gear 12 (Figs. 1 and 2) meshing with another gear 13 which is secured to a transverse shaft 16 rotatably arranged in the housing 1a. A pawl support 23 is secured to the transverse shaft 16 for rotation therewith and carries a pair of pawls 25, 25 retained by pivot pins 24, 24 on the opposite ends thereof. A gear 14 mounted on the transverse shaft 16 and freely rotatable thereon has on one side thereof a number of coaxial ratchet teeth 22 with which the pawls 25, 25 cooperate. The gear 14 meshes with a gear 15 rotatably mounted on a transverse shaft 18 which is secured to the housing 1a and is integral with or fixed to a flywheel17.

A power generator 19 has a stator 20 secured to the housing 1a around the transverse shaft 16 and, arranged opposite to the stator 20 and secured to the transverse shaft 16, a rotor 21 which is also connected to the gear 14 for rotation therewith. The stator 20 includes a nunber of windings (approximately 260) of a copper wire having a diameter about 0–20~0–.25 mm, and the rotor 21 is of eight poles and of a residual magnetic flux density 2200~2400G.

The gears 10, 12, 13, 14, 15 are all of a module 0.5 and have the following pitch circles D and gear teeth Z:

Pinion 10	8 Dmm	10Z
Gear 12	48.5 Dmm	97Z
Gear 13	6.5 Dmm	13Z
G ar 14	34 Dmm	68Z
Gear 15	20 Dmm	40Z

As is apparent from the above indicated values, the gears 13, 14 rotate approximately 7.5 times as fast as the gear 12, and the g ar 15 rotates approximately 12.7 times as fast as the gear 12.

The sector rack 7 of the manually operated lever 5 has a lateral projection 5b formed on

the back thereof as particularly shown in Figs. 1 and 2. On the rear end of the housing 1a is a locking device 26 including a locking element 26a which is manually slidable in a direction transversely of the housing 1a to releasably engage the lateral projection 5b of the sector rack 7. The locking element 26a engages the projection 5b to hold the manually operated lever 5 at the lower position as illustrated by a solid line in Fig. 1, if the locking element 26b is moved to a predetermined position after the manually operated lever 5 is pressed down against the action of the torsion spring 8. Thus manually operated lever 5 can be prevented from moving to the upper position as (shown dotted) when the electric torch is not is use.

As shown in Figs. 1 and 3, there is a hook 27 on the bottom of the housing 1a at the back end thereof, by which to hang the torch on to the wall or the like when the torch is not in use. A red fluorescent reflecting plate may be attached to the hook 27, so that the position of the torch may be instantly identified when it is needed.

When required to use the locking element 26a is first moved to the right in Fig. 3, so releasing the manually operated lever 5 which then moves under the action of the torsion spring 8, to the upper position as illustrated by the dotted line. When the manually operated lever 5 is depressed against the action of the torsion spring 8, the gear 13 rotates in the counterclockwise direction as shown by an arrow C by the sector rack 7, the pinion 10 and the gear 12. Thus the transverse shaft 16 rotates in the same direction. As the shaft 16 r tates, the pawls 25, 25 on the pawl support 23 rotate in the same direction and the gear 14 turns with a speed approximately 7.5 times as fast as that of the gear 12. The rotor 21 is therefore rotated within the stator 20 so generating electric power, the instantaneous maximum voltage (greater than 2.5v) being supplied to the electric lamp 4. Rotation of the gear 14 is also transmitted to the gear 15, and therefore the flywheel 17 rotates in the clockwise direction at a speed approximately 12.7 times as fast as the speed of the gear 12. The gear 14, and rotor 21, rotate at a speed lower than the speed of the flywheel 17.

By virtue of the sustained rotation and large applied torque the rotor 21 continues to rotate so generating power to supply the lamp 4, ven for some time, typically 3 to 6 seconds, after the manually operated lever has been depressed.

Experiments have shown that the user need only depress the lever intermittently, approximately once in 4–5 seconds as compared with once every second for conventional portable electric torches.

Upon release the lever 5 returns to the upper position (under the action of the torsion spring 8) and the pawls 25, 25 rotate in the direction opposite to that of the gear 14, the pinion 10, the gear 12, and the gear 13 and the transverse shaft 16. Since the pawls 25, 25 yield against the rack teeth 22, there is no effect on the power generating rotation of the gear 14 in the direction as indicated by the arrow C in Fig. 1, until the manual lever 5 is depressed once again. The user of the torch is therefore only required to operate the lever 5 slowly as compared with the regular rapid movement required in conventional devices. This is less tiring. Moreover, since the manually operated lever 5 is pivoted at the forward end of the housing 1a, the beam of light produced can be held stable as the lever 5 is moved up and down.

The torch described above can be held and operated in one hand but if required the lamp may be separate or separable from the body of the torch housing the power generator, a cable or lead being connected between the two for supplying electrical power to the lamp. Further, the lever may be adapted for operation by foot instead of by hand. This may be especially advantageous for example when inspecting or repairing a car since the lamp could be clamped or suspended on the car and the lever operated by the foot leaving the hands of the user free.

In another embodiment of the invention, the electric lamp 4 may be replaced by a hollow shaft carrying at its free end a nichrome wire connected to the power generator 19 in the housing 1a, so that the generated power may be used to heat the nichrome wire. In this case, the power generator device may be used as a lighter for igniting (e.g.) a petroleum stove.

CLAIMS

1. A portable power generating device of the kind in which a mechanical drive operated by the user imparts motion to the rotor of an electrical power generator, wherein motion is transmitted to the rotor by a mechanism comprising a gear train driving the rotor and a flywheel, the motion of the flywheel being transmitted to a gear driving the rotor, by another gear which rotates faster than the gear driving the rotor.

2. A device according to claim 1 wherein the mechanical drive comprises a pivoted lever mounted externally of a housing of the device.

3. A device according to claim 1 or claim 2 wherein a housing for the device also contains an electrical load connected for the supply of electrical power thereto, to the generator.

4. A device according to any one of claims 1 to 3, wherein the electrical load comprises an electric lamp.

5. A device according to any one of claims 1 to 3, wherein the electrical load

comprises a heating element.

6. A device according to claim 5 wherein the heating element is a nichrome wire.

7. A device according to any one of claim 1 to 6, wherein the device has an elongate housing, in the forward end part of which is arranged an electrical load connected to the power generator, and wherein the mechanical drive comprises a manually operated lever on the outside of the housing and pivoted at the said forward end part so lending stability and balance in the hand of the user during movement of the lever between an upper inoperative position in which the lever is spaced from the housing and a lower operative position in which the lever is adjacent to the housing.

8. A device according to claim 2 or claim 7, further comprising rack means linking the manually operated lever to the gear train, and locking means operable to releasably engage the rack to hold the manually operated lever in a retracted position.

9. A device according to any one of claims 1 to 8, further comprising a hook by which the device can be suspended, and a fluorescent reflector on the hook.

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